AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (currently amended) A method of removing an acid gas from a feed gas ~~plant~~ comprising:

feeding into an absorber ~~that receives a~~ the feed gas at a pressure of at least 400 psig, wherein the feed gas comprises ~~and comprising~~ at least 5 mol% carbon dioxide, wherein the absorber is operated at an isothermal or decreasing top-to-bottom thermal gradient, ~~and~~

wherein the absorber employs a physical solvent to at least partially remove an acid gas from the feed gas to thereby produce an absorber overhead product, a semi-rich solvent, and a rich solvent;

cooling the semi-rich solvent using refrigeration content of at least partially expanded rich solvent; and

cooling the feed gas using refrigeration content of the at least partially expanded rich solvent and the absorber overhead product.

2. (canceled)

3. (currently amended) The method ~~plant~~ of claim 1 wherein the ~~absorber produces a~~ rich solvent ~~that~~ is expanded in at least two steps, wherein expansion in one step produces work, and wherein expansion in another step provides refrigeration for ~~at least one of a~~ the semi-rich solvent ~~produced by the absorber~~ and optionally a carbon dioxide product.

4. (currently amended) The method ~~plant~~ of claim 1 wherein the ~~absorber produces a~~ rich solvent ~~that~~ is expanded in at least three steps, wherein expansion in the at least three steps produces at least three recycle streams, respectively, and wherein the at least three recycle streams are fed into the absorber.

5. (currently amended) The method ~~plant~~ of claim 4 wherein the at least three recycle streams are compressed to form a compressed recycle stream, and wherein further refrigeration is provided by Joule-Thomson cooling of compressed recycle stream.

6. (currently amended) The method ~~plant~~ of claim 1 wherein the feed gas is cooled by the at least partially expanded rich solvent.

7. (currently amended) The method ~~plant~~ of claim 6 wherein the feed gas is further cooled by the ~~an~~ absorber overhead product.

8. (currently amended) The method ~~plant~~ of claim 1 wherein at least part of the acid gas is removed from the physical solvent at a pressure of between about 1 psia to 10 psia.

9. (currently amended) The method ~~plant~~ of claim 1 wherein the feed gas has a pressure between about 400 psig to about 3000 psig, and wherein the feed gas is at least partially dehydrated.

10. (currently amended) The method ~~plant~~ of claim 1 wherein the feed gas has an acid gas content of between about 10 mol% to about 75 mol%.

11. (currently amended) The method ~~plant~~ of claim 1 wherein the feed gas comprises natural gas.

12. (currently amended) The method ~~plant~~ of claim 1 wherein the absorber is operated at a bottom temperature of about -25°F to about -45°F.

13. (currently amended) The method ~~plant~~ of claim 1 wherein the ~~absorber produces a~~ rich solvent ~~that~~ is expanded to provide refrigeration for a carbon dioxide product.

14. (currently amended) The method ~~plant~~ of claim 1 wherein the feed gas has a pressure of at least 1000 psig, and wherein at least a portion of the acid gas in the feed gas is removed from the feed gas using a membrane separator.

15. (currently amended) A plant comprising:

a gas source that is configured to provide natural gas comprising at least 5 mol% acid gas at a pressure of at least 400 psig;

an absorber fluidly coupled to the gas source and configured to receive the ~~that receives a~~ natural gas ~~comprising at least 5 mol% acid gas and having a pressure of at least 400 psig,~~ and further configured to form a semi-rich solvent from a physical solvent;

~~a physical solvent that absorbs at least a portion of the acid gas in the absorber to form a semi-rich solvent;~~

a cooler fluidly coupled to the absorber and configured to cool ~~that receives and cools~~ the semi-rich solvent and to provide ~~provides~~ the cooled semi-rich solvent back to the absorber at a temperature suitable to absorb ~~wherein the cooled semi-rich solvent further absorbs~~ at least another portion of the acid gas to thereby allow formation of ~~form~~ a rich solvent in the absorber;

first and second expansion devices fluidly coupled to the absorber and further fluidly coupled to respective first and second heat exchangers, wherein the first and second expansion devices and heat exchangers are configured to allow cooling of the ~~wherein~~ the natural gas and the semi-rich solvent in the first and second heat exchangers, respectively, ~~are cooled at least in part~~ by expansion of the rich solvent; and

wherein the first and second expansion devices and heat exchangers are further configured to allow operation of the absorber with an isothermal or decreasing top-to-bottom thermal gradient.

16. (currently amended) The plant of claim 15 wherein the first and second heat exchangers are configured such that cooling of the natural gas and the semi-rich solvent provides an isothermal or decreasing top-to-bottom thermal gradient in the absorber.

17. (currently amended) The plant of claim 15 wherein the first and second expansion devices are configured to allow formation of ~~expansion of the rich solvent provides~~ at least one hydrocarbon containing recycle stream from the rich solvent, and further comprising a recycle compressor that is configured to receive and compress the recycle

stream to a pressure suitable for feeding the ~~and wherein the at least one hydrocarbon containing~~ recycle stream ~~is fed~~ back to the absorber.

18. (currently amended) The plant of claim 17 ~~wherein the at least one recycle stream is compressed to form a compressed recycle stream, and wherein~~ further comprising a JT valve that is coupled to the recycle compressor and configured to expand the compressed recycle stream to thereby provide refrigeration ~~is provided by Joule-Thomson cooling of~~ to the compressed recycle stream.

19. (currently amended) The plant of claim 17 ~~wherein further expansion of the rich solvent liberates at least a portion of the acid gas from the solvent, and wherein~~ further comprising a vacuum stripper that is configured to strip the solvent ~~stripping~~ at a pressure of about 1 psia to about 10 psia to thereby produce ~~produces~~ a lean solvent.

20. (currently amended) The plant of claim 15 wherein the gas source is configured to provide the natural gas ~~has~~ at a pressure of at least about 1000 psig, and further comprising a membrane separator that is coupled to the gas source and configured to allow removal of ~~wherein~~ at least a portion of the acid gas in the natural gas ~~is removed from the natural gas using a membrane separator~~.

21. (currently amended) The <u>method</u> ~~plant~~ of claim 1 further comprising a conduit fluidly coupled to ~~wherein a hydrocarbon liquid stream is formed on a discharge of~~ a recycle gas cooler~~, wherein the recycle gas cooler and the conduit are configured~~ to allow withdrawal of a hydrocarbon liquid stream ~~can be recovered~~ as a liquid product from the ~~while reducing an amount of~~ recycle gas.

22. (canceled)

23. (original) The plant of claim 15 further comprising a third expansion device that is configured to receive the rich solvent and to allow for production of at least one of work and refrigeration for a carbon dioxide product.